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Through the science-based Stockpile Stewardship and Management Program, we will ensure the continued safety, security, and reliability of the U.S. nuclear stockpile

Mission

The Stockpile Stewardship and Management Program is an integrated undertaking of the Department of Energy nuclear weapons complex. This complex includes the Livermore, Los Alamos, and Sandia national laboratories, the production plants at Kansas City, Oak Ridge, Pantex, and Savannah River, and the Nevada Test Site. Through this program, we will provide scientific answers to weapons questions previously answered by nuclear testing. We will sustain the knowledge and skill bases unique to nuclear weapons and apply this expertise to ensure the continued safety, security, and reliability of the U.S. nuclear stockpile.

The Post-Cold War Era

The environment in which Livermore (together with Los Alamos and Sandia) must carry out its nuclear weapons responsibilities has changed dramatically in the past few years. The U.S. is observing a moratorium on nuclear testing and the Administration is pursuing negotiation of a zero-yield comprehensive test ban. The numbers of warheads and weapon systems in the U.S. nuclear stockpile are being greatly reduced. In addition, since the development and production of new-design nuclear weapons have been halted and much of the production complex has been shut down, the weapons that remain in the stockpile will be significantly older than previously anticipated. There is also increasing concern about the threat to national security posed by the proliferation of nuclear weapons and weapon technology.

Science-Based Stewardship and Management

On September 25, 1995, President Clinton reaffirmed the need for Livermore and the other two nuclear weapons laboratories and the science-based Stockpile Stewardship and Management Program. Responsibility for maintaining the U.S. nuclear deterrent presents significant new challenges. Stockpile problems must be anticipated or detected and then evaluated and resolved without nuclear testing. Existing warheads and weapon systems will have to be refurbished to extend stockpile lifetimes and to meet future military requirements. Vigorous efforts are required in surveillance, assessment, refurbishment, and certification of the weapons that remain in the stockpile, and an enhanced scientific understanding is needed to compensate for the unavailability of nuclear testing.

Several tri-laboratory initiatives have been established to provide the necessary improvements in our scientific and technical capabilities. For example:

• **The Enhanced Surveillance Initiative** will develop new instrumentation and technologies to anticipate changes that might occur in stockpile weapons due to aging, environmental exposure, and materials incompatibilities and to assess their effects on weapon safety and reliability.

• **The Accelerated Strategic Computing Initiative** will develop more complete physics models of weapon performance, provide thousand-fold increases in computational speed and data storage, develop suites of three-dimensional computational models, and make the transition to advanced computational architectures (e.g., massively parallel processing).
• **The Advanced Production and Design Technology Program** will develop materials and manufacturing technologies that are environmentally responsible, cost effective, and efficient. The laboratories' R&D activities will be closely integrated with those of the manufacturing and fabrication facilities. In many instances, the design of replacement parts and retrofits will be done concurrently with the development and demonstration of the manufacturing technologies.
• **Advanced experimental facilities** will provide necessary data to help validate our computational models and assessments of weapon safety and reliability. These facilities include:

- *The National Ignition Facility* to produce high-temperature, high-pressure, high-energy-density conditions relevant to nuclear weapon performance.
- *Advanced hydrodynamic capability* to provide three-dimensional, time-dependent views of the high-explosive implosion.
- *The Atlas pulsed-power facility* to produce implosions of centimeter-scale metallic shells for high-resolution experiments related to secondary hydrodynamics and primary implosion hydrodynamics.

Livermore's Unique Contributions

Livermore retains responsibility for the stockpile weapon systems it designed throughout their stockpile life until they are retired, dismantled, and disposed of. Specific stockpile stewardship activities depend on each system's specific features.

Livermore maintains particular nuclear-weapons-related expertise in:
• High-power lasers and inertial confinement fusion.
• Uranium metallurgy and processing, including atomic vapor laser isotope separation (AVLIS) technology.
• High explosives.
• Nuclear chemistry.
• Precision fabrication.
• Computational physics and numerical simulation.

Contact

George H. Miller, Associate Director, Defense and Nuclear Technologies;
Phone: (510) 423-6806; Fax: (510) 423-5016; E-mail: miller21@llnl.gov

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